

WHAT IS CLAIMED IS:

1. A process for depositing marking material onto a substrate which comprises (a) providing a propellant to a head structure, said head structure having at least one channel therein, said channel having an exit orifice with a width no larger than about 250 microns through which the propellant can flow, said propellant flowing through the channel to form thereby a propellant stream having kinetic energy, said channel directing the propellant stream toward the substrate, and (b) controllably introducing a particulate marking material into the propellant stream in the channel, wherein the kinetic energy of the propellant particle stream causes the particulate marking material to impact the substrate, and wherein the particulate marking material comprises toner particles which comprise a polyester resin, an optional colorant, and polypyrrole, said toner particles having an average particle diameter of no more than about 10 microns and a particle size distribution of GSD equal to no more than about 1.25, wherein said toner particles are prepared by an emulsion aggregation process, said toner particles having an average bulk conductivity of at least about 10^{-11} Siemens per centimeter.

2. A process according to claim 1 wherein the toner particles have an average particle diameter of no more than about 13 microns.

3. A process according to claim 1 wherein the toner particles comprise a core comprising the polyester resin and optional colorant and, coated on the core, a coating comprising the polypyrrole.

4. A process according to claim 1 wherein the polyester resin is polyethylene terephthalate, polypropylene terephthalate, polybutylene terephthalate, polypentylene terephthalate, polyhexalene terephthalate, polyheptadene terephthalate, polyoctalene-terephthalate, poly(propylene-diethylene terephthalate), poly(bisphenol A-fumarate), poly(bisphenol A-terephthalate), copoly(bisphenol A-terephthalate-copoly(bisphenol A-fumarate), poly(neopentyl-terephthalate), or mixtures thereof.

5. A process according to claim 1 wherein the polyester resin is a sulfonated polyester.

6. A process according to claim 1 wherein the polyester resin is a poly(1,2-propylene-5-sulfoisophthalate), a poly(neopentylene-5-sulfoisophthalate), a poly(diethylene-5-sulfoisophthalate), a copoly(1,2-propylene-5-sulfoisophthalate)-copoly-(1,2-propylene-terephthalate phthalate), a copoly(1,2-propylene-diethylene-5-sulfoisophthalate)-copoly-(1,2-propylene-diethylene-terephthalate phthalate), a copoly(ethylene-neopentylene-5-sulfoisophthalate)-copoly-(ethylene-neopentylene-terephthalate-phthalate), a copoly(propoxylated bisphenol A)-copoly-(propoxylated bisphenol A-5-sulfoisophthalate), a copoly(ethylene-terephthalate)-copoly-(ethylene-5-sulfo-isophthalate), a copoly(propylene-terephthalate)-copoly-(propylene-5-sulfo-isophthalate), a copoly(diethylene-terephthalate)-copoly-(diethylene-5-sulfo-isophthalate), a copoly(propylene-diethylene-terephthalate)-copoly-(propylene-diethylene-5-sulfoisophthalate), a copoly(propylene-butylene-terephthalate)-copoly(propylene-butylene-5-sulfo-isophthalate), a copoly(propoxylated bisphenol-A-fumarate)-copoly(propoxylated bisphenol A-5-sulfo-isophthalate), a copoly(ethoxylated bisphenol-A-fumarate)-copoly(ethoxylated bisphenol-A-5-sulfo-isophthalate), a copoly(ethoxylated bisphenol-A-maleate)-copoly(ethoxylated bisphenol-A-5-sulfo-isophthalate), a copoly(propylene-diethylene terephthalate)-copoly(propylene-5-sulfoisophthalate), a copoly(neopentyl-terephthalate)-copoly-(neopentyl-5-sulfoisophthalate), or a mixture thereof.

7. A process according to claim 1 wherein the resin is present in the toner particles in an amount of at least about 75 percent by weight of the toner particles and wherein the resin is present in the toner particles in an amount of no more than about 99 percent by weight of the toner particles.

8. A process according to claim 1 wherein the toner particles further comprise a pigment colorant.

9. A process according to claim 1 wherein the toner particles contain a colorant, said colorant being present in an amount of at least about 1 percent by weight of the toner particles, and said colorant being present in an amount of no more than about 25 percent by weight of the toner particles.

10. A process according to claim 1 wherein the emulsion aggregation process comprises (1) shearing a first ionic surfactant with a latex mixture comprising (a) a counterionic surfactant with a charge polarity of opposite sign to that of said first ionic surfactant, (b) a nonionic surfactant, and (c) a polyester resin, thereby causing flocculation or heterocoagulation of formed particles of resin to form electrostatically bound aggregates; and (2) heating the electrostatically bound aggregates to form aggregates of at least about 1 micron in average particle diameter.

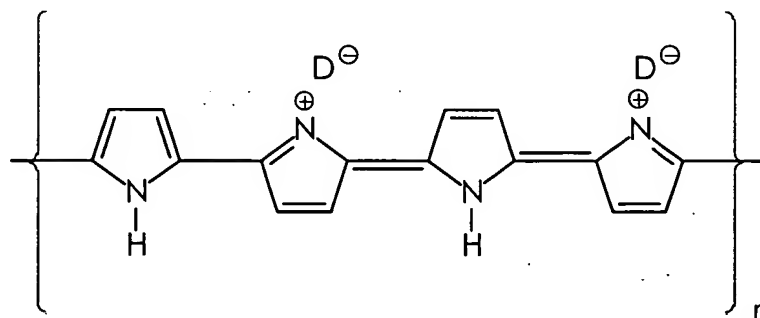
11. A process according to claim 1 wherein the emulsion aggregation process comprises (1) preparing a colorant dispersion in a solvent, which dispersion comprises a colorant and a first ionic surfactant; (2) shearing the colorant dispersion with a latex mixture comprising (a) a counterionic surfactant with a charge polarity of opposite sign to that of said first ionic surfactant, (b) a nonionic surfactant, and (c) a polyester resin, thereby causing flocculation or heterocoagulation of formed particles of colorant and resin to form electrostatically bound aggregates; and (3) heating the electrostatically bound aggregates to form aggregates of at least about 1 micron in average particle diameter.

12. A process according to claim 1 wherein the emulsion aggregation process comprises (1) shearing an ionic surfactant with a latex mixture comprising (a) a flocculating agent, (b) a nonionic surfactant, and (c) a polyester resin, thereby causing flocculation or heterocoagulation of formed particles of colorant and resin to form electrostatically bound aggregates; and (2) heating the electrostatically bound aggregates to form aggregates of at least about 1 micron in average particle diameter.

13. A process according to claim 1 wherein the emulsion aggregation process comprises (1) preparing a colorant dispersion in a solvent, which dispersion comprises a colorant and an ionic surfactant; (2) shearing the colorant dispersion with a latex mixture comprising (a) a flocculating agent, (b) a nonionic surfactant, and (c) a polyester resin, thereby causing flocculation or heterocoagulation of formed particles of colorant and resin to form electrostatically bound aggregates; and (3) heating the electrostatically bound aggregates to form aggregates of at least about 1 micron in average particle diameter.

14. A process according to claim 1 wherein the emulsion aggregation process comprises (1) preparing a colloidal solution comprising a polyester resin and an optional colorant, and (2) adding to the colloidal solution an aqueous solution containing a coalescence agent comprising an ionic metal salt to form toner particles.

15. A process according to claim 1 wherein the polypyrrole is of the formula



wherein D^- corresponds to the dopant and n is an integer representing the number of repeat monomer units.

16. A process according to claim 1 wherein the polypyrrole has at least about 3 repeat monomer units.

17. A process according to claim 1 wherein the polypyrrole has at least about 6 repeat monomer units and wherein the polypyrrole has no more than about 100 repeat monomer units.

18. A process according to claim 1 wherein the polypyrrole is doped with iodine, molecules containing sulfonate groups, molecules containing phosphate groups, molecules containing phosphonate groups, or mixtures thereof.

19. A process according to claim 1 wherein the polypyrrole is doped with sulfonate containing anions of the formula RSO_3^- wherein R is an alkyl group, an alkoxy group, an aryl group, an aryloxy group, an arylalkyl group, an alkylaryl group, an arylalkyloxy group, an alkylaryloxy group, or mixtures thereof.

20. A process according to claim 1 wherein the polypyrrole is doped with anions selected from p-toluene sulfonate, camphor sulfonate, benzene sulfonate, naphthalene sulfonate, dodecyl sulfonate, dodecylbenzene sulfonate, dialkyl benzenealkyl sulfonates, para-ethylbenzene sulfonate, alkyl naphthalene sulfonates, poly(styrene sulfonate), or mixtures thereof.

21. A process according to claim 1 wherein the polypyrrole is doped with anions selected from p-toluene sulfonate, camphor sulfonate, benzene sulfonate, naphthalene sulfonate, dodecyl sulfonate, dodecylbenzene sulfonate, 1,3-benzene disulfonate, para-ethylbenzene sulfonate, 1,5-naphthalene disulfonate, 2-naphthalene disulfonate, poly(styrene sulfonate), or mixtures thereof.

22. A process according to claim 1 wherein the polypyrrole is doped with a dopant present in an amount of at least about 0.1 molar equivalent of dopant per molar equivalent of pyrrole monomer and present in an amount of no more than about 5 molar equivalents of dopant per molar equivalent of pyrrole monomer.

23. A process according to claim 1 wherein the polypyrrole is doped with a dopant present in an amount of at least about 0.25 molar equivalent of dopant per molar equivalent of pyrrole monomer and present in an amount of no more than about 4 molar equivalents of dopant per molar equivalent of pyrrole monomer.

24. A process according to claim 1 wherein the polypyrrole is doped with a dopant present in an amount of at least about 0.5 molar equivalent of dopant per molar equivalent of pyrrole monomer and present in an amount of no more than about 3 molar equivalents of dopant per molar equivalent of pyrrole monomer.

25. A toner according to claim 1 wherein the toner particles have an average bulk conductivity of no less than about 10^{-7} Siemens per centimeter, and wherein the toner particles have an average bulk conductivity of no more than about 10 Siemens per centimeter.

26. A toner according to claim 1 wherein the toner particles have an average bulk conductivity of no more than about 10 Siemens per centimeter.

27. A toner according to claim 1 wherein the toner particles have an average bulk conductivity of no more than about 10^{-7} Siemens per centimeter.

28. A toner according to claim 1 wherein the polypyrrole is present in an amount of at least about 5 weight percent of the toner particle mass and wherein the polypyrrole is present in an amount of no more than about 20 weight percent of the toner particle mass.

29. A process according to claim 1 wherein each said channel has a converging region and a diverging region, and wherein said propellant is introduced in said converging region and flows into said diverging region, whereby said propellant is at a first velocity and first pressure in said converging region and a second velocity and a second pressure in said diverging region, said first pressure greater than said second pressure and said first velocity less than said second velocity.